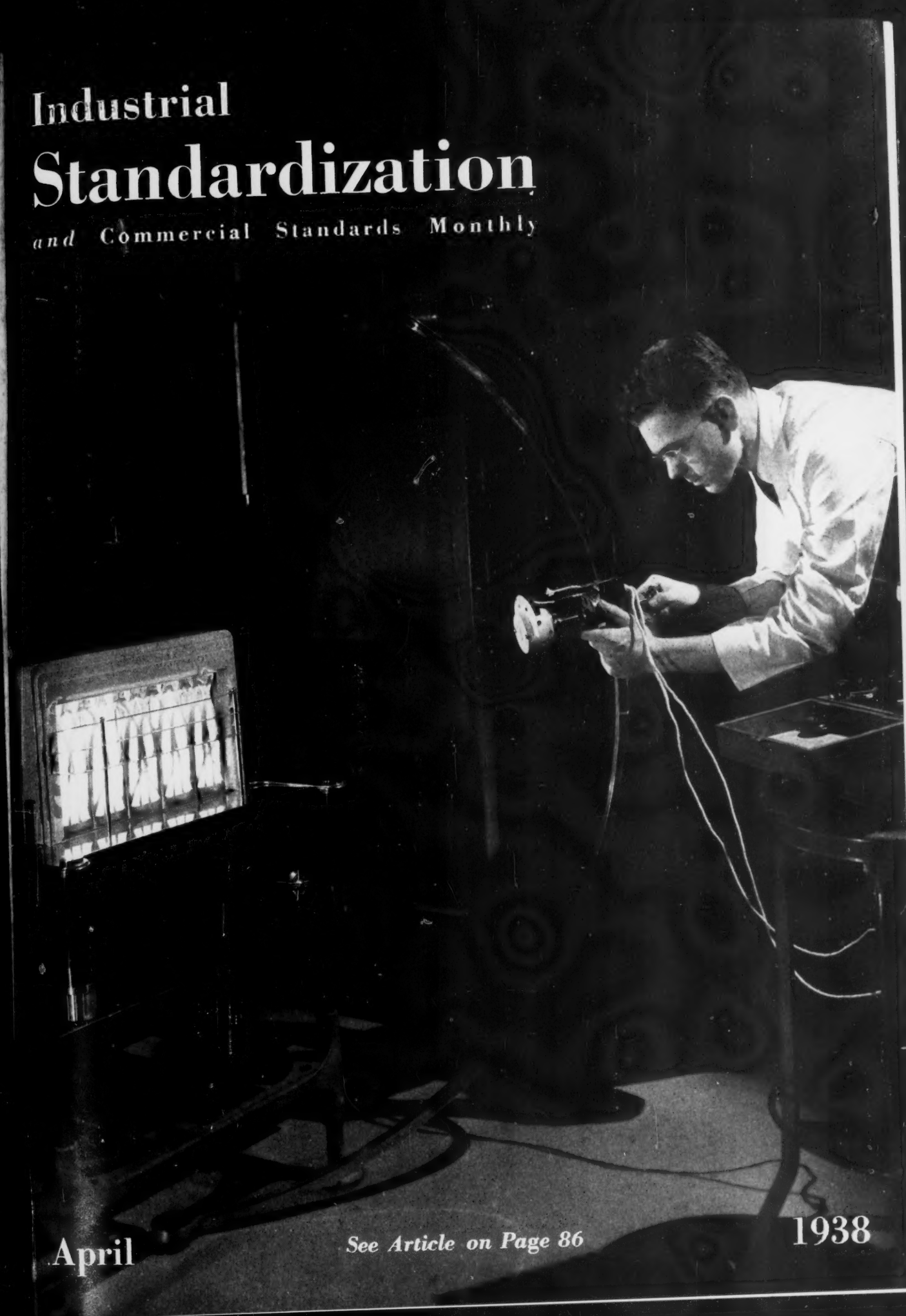
Industrial Standardization

and Commercial Standards Monthly



April

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1938

Engineering
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Standards and the Government

THE Federal Government, as the nation's largest purchaser, is interested in a wide range of specifications for materials and apparatus; and through its huge research and service bureaus it is interested in innumerable standardization questions. This interest is reflected in the close cooperation which exists between the ASA and Government.

Eight executive agencies of the Federal Government—the departments of Agriculture, Commerce, Interior, Labor, Navy, and War, the Federal Housing Administration, and the U. S. Government Printing Office—hold membership in the American Standards Association. More than forty federal bureaus are officially cooperating in the work. The National Bureau of Standards alone is represented on over 80 ASA projects, and has taken a leading part in the ASA's safety code program. Its Director is a member of the Board of the American Standards Association. Much of the work carried on by the Bureau has aided in the development of American Standards.

The work of the American Standards Association in several fields provides an outstanding example of cordial and effective industry-government relations. The fifty industrial safety codes so far completed are serving as the basis of accident prevention regulations of state labor departments and industrial commissions, and similar activities by municipalities. The Division of Labor Standards of the U. S. Department of Labor is actively promoting their use. A survey as to use of the recently approved American Standard for Safety Glass indicates that of 32 states requiring safety glass, 20 have adopted the American Standard tests and specifications in full.

There is correspondingly close cooperation with government agencies in the work on traffic standards; on electrical codes; in the program of codes for the prevention of occupational diseases; in the building code program and in the consumer goods work.

Many industrial problems to which engineering methods apply and which concern both government and industry are being solved through the methods of the ASA.

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RUTH E. MASON, *Editor*

This Issue

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ASA

Standardization is dynamic, not static. It means not to stand still, but to move forward together.

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April, 1938 **Vol. 9, No. 4**

Scientific Body Measurements Needed—

Non-Standard Ready-Made Garment Sizes Take Toll from Industry and Consumer

by

Boris Stephen Yane

Standards Section, Consumers' Project
U. S. Department of Labor

PROBABLY one of the best-known of the wasteful and archaic practices which can still be found at times despite our scientific progress in industry and commerce is the way in which ready-to-wear clothing is marked for size. So widespread is this problem that practically everyone has at one time or another had some unfortunate or annoying experience traceable to lack of standard sizes. Much of the loss due to returned goods has been traced to it.

"Dimensions now used in the sizing of ready-to-wear garments and patterns are 'guesses' which have grown up in the industries concerned," says a government clothing expert who has made a careful survey of the available standards for clothing sizes. "No study of the measurements needed for garment and pattern sizes has ever been made in which recognized anthropometric methods and instruments or statistically sound methods of sampling and analyzing data have been used." She goes on to explain that any measurements that have been taken have been secured by sales clerks or employees of dress form manufacturers, or others totally untrained in anthropometry and with no appreciation of the methods and instruments which should be used in studies of this kind. "Upon investigation," she explains, "it is always found that measurements quoted as accurate by manufacturing groups have been taken with ordinary commercial tape measures with no consideration of the amount of clothing on the individual at the time of measurement, definite body landmarks, numbers of persons measured, etc."

The measurement of United States Army soldiers at the close of the World War represents about the only "scientifically acceptable" study of this kind which has been made. Unfortunately, these measurements are not adaptable to the construction of civilian clothing.

That some merchants are keenly aware of the lack of scientific garment sizes is shown by the experience of the director of testing laboratories of one of America's great retail establishments. In an attempt to arrive at size specifications for the children's clothing sold by her organization, she collected all available data on body measurements and made tables of average body measurements for boys and girls of different ages and nationalities. After several months of work she came to the conclusion that most of the available measurements were not applicable to clothing

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The Standards Section of the Consumers' Project, U. S. Department of Labor, under the direction of S. P. Kaidanovsky, here presents the status of size standards for ready-made garments. The Section, in studying the problem, has brought together the findings of the various Government bureaus on this subject, as well as experiences of trade organizations.

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problems, inasmuch as they were primarily taken from a health standpoint. The anthropometrists taking the measurements were not concerned with arms, legs, and other such measurements necessary for clothing construction, but collected data with regard to height, weight, and circumference of head and chest.

She also found that authorities varied in their methods of taking measurements. No allowance was made for geographical differences in the construction of averages. After studying all available data she came to the conclusion that "the problem of average standard measurments to be used in the clothing industry should be based on new data, taken with the clothing problem in mind."

A wooden anthropometer is used to measure stature. This is an inexpensive model designed especially for its child-measurement study by the U. S. Bureau of Home Economics.

Trial and Error Methods

Though manufacturers realize that it would be to their advantage to eliminate existing confusion in the ready-to-wear industry and place it on a more scientific basis, they are afraid of cooperating with others because they do not wish to disclose trade secrets, says *The Consumer*, former publication of the Consumers' Division, U. S. Department of Labor, commenting in its issue of December 15, 1935, on the lack of progress toward a more scientific basis for measurements. It is obviously impossible for any single manufacturer to bear the costs of an adequate investigation, it remarks. Thus, the manufacturer "continues on his blind voyage of trial and error."

Consequently, says *The Consumer*, "he still guesses and idealizes about the woman's figure . . . with the result that clothes are made chiefly for women under twenty years. Ninety per cent between the ages of fifteen and nineteen can step into ready-made dresses easily enough, while only 50 per cent between the ages of twenty and forty-four, and 33 per cent over forty-five can wear them without alterations."

"Wrong Size" Most Frequent Reason for Returns

In a study of returned goods made by Ada Lillian Bush of the U. S. Department of Commerce, women's and children's clothing accounted for over 40 per cent of the merchandise returned.[1] For all merchandise, the reason for return given most frequently was wrong size. Though some of the returns are due to the customer asking for the wrong size, the study points out that in many cases the customer feels that the producer is responsible for and could correct the situation. "In fact," states the report, "of all statements by consumers specifically attaching blame to manufacturers for some returns, by far the largest number were concerned with producer responsibility for size problems." Though this was particularly

[1]Average for 10 states. U. S. Dept. of Commerce, *Consumer Viewpoint on Returned Goods*, 1934. (Table 2, p. 6). This estimate does not include such items as millinery, hose, or shoes.

true with respect to clothing, references to difficulties in obtaining correct size were found in most of the reports of returned goods in which size was important. The majority of consumers stressed the lack of uniformity in measurements and proportions of similar products produced by different manufacturers.

The study then quotes a mother's comment as "typical of many": "Often I have to put off buying things the children actually need and could have if it were not for the difficulty of getting the right size. It is not always possible to take the children along. . . . If a new sweater, shoes, etc., exactly the size that is marked on the clothing being worn by the child, is asked for and the size markings verified, the purchased goods may be either too large or too small."

The report gives another illustration of this problem by pointing out that some saleswomen find it necessary to caution the customer, "It is marked '36' but this manufacturer makes his thirty-sixes small," or "These size '38' blouses run large."[2]

A survey of the returned goods problem in Boston revealed that approximately 22 per cent of the merchandise returned during the period studied was returned because of "wrong size." Said D. Bloomfield, manager of the Boston Retail Trade Board, who conducted the study, "Investigation showed that a large number of garments were improperly sized by the manufacturer, a condition prevailing generally."

(Continued on page 80)

[2]Op. cit. (p. 8.)

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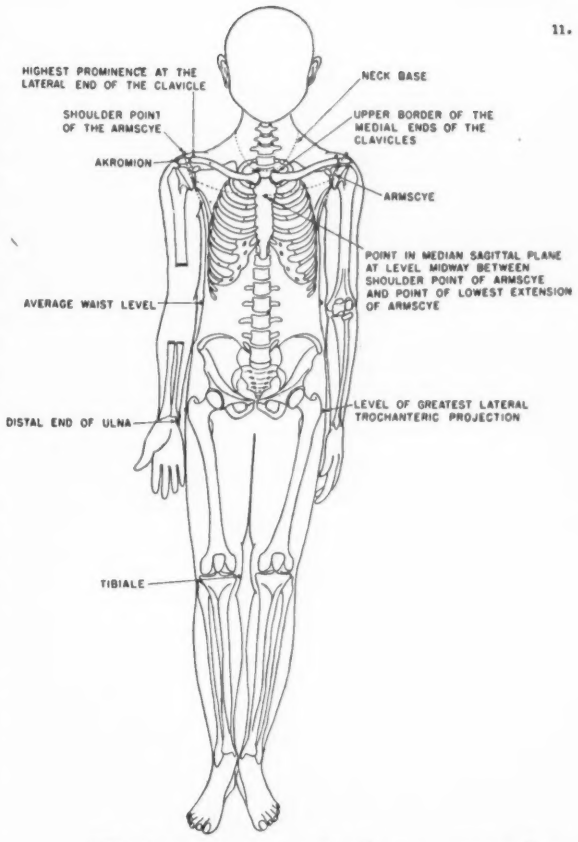

HIGHEST PROMINENCE AT THE LATERAL END OF THE CLAVICLE
NECK BASE
SHOULDER POINT OF THE ARMSCYE
UPPER BORDER OF THE MEDIAL ENDS OF THE CLAVICLES
AKROMION
ARMSCYE
POINT IN MEDIAN SAGITTAL PLANE AT LEVEL MIDWAY BETWEEN SHOULDER POINT OF ARMSCYE AND POINT OF LOWEST EXTENSION OF ARMSCYE
AVERAGE WAIST LEVEL
LEVEL OF GREATEST LATERAL TROCHANTERIC PROJECTION
DISTAL END OF ULNA
TIBIALE

Workers are trained to recognize these points on a child's body as a basis for scientific measurements. Other charts show points to be measured on the child's side and back.

Standard equipment used by each squad of the U. S. Bureau of Home Economics taking children's body measurements. Each kit contains two wooden anthropometers, a protractor head, a sliding caliper, a two-meter steel tape, a two-meter linen tape, two skin pencils for marking body landmarks, a neck chain, a steel knitting needle to indicate the direction of straight lines on the body, and a set of schedule forms for recording the measurements.

Using a protractor head to measure the slope of a boy's shoulder line. The revolving protractor carries a spirit level which when set in a horizontal plane permits one to read directly from the protractor scale the angle formed by the shoulder line with the horizontal plane.

An indication of the costliness of returned goods transactions is furnished by the Ohio State University Bureau of Business Research.[3] Not less than 23 persons are required to perform the transactions involved in a charge purchase delivered and picked up by a department store. Cost of charge transactions varied from 32 to 62 cents, being slightly more expensive than cash transactions. However, the greatest losses occur from the necessity of reselling returned merchandise at considerable reductions.

That consumer groups are becoming aware of the economic implications of the problem is shown by the following resolution passed by the District of Columbia Federation of Women's Clubs:[4] "We, as organized women's clubs, have studied this customer-dealer problem over a period of months and have come to a realization that the returned goods practice represents a growing expense and an avoidable waste by customers and stores * * * * we are convinced that such expensive service only 'serves' to add undesirable costs that are a mutual disadvantage * * * Such wasteful practices and unprofitable business tend to work against steady distribution and employment, and are reflected back to the producer and wage earner in the form of avoidable losses and unemployment."

What is Being Done About It

That the situation with regard to sizes is an extremely serious one and that something needs to be done is conceded by all concerned. The National Bureau of Standards, at the request of interested trade associations, has promulgated voluntary commercial standards for men's pajamas, boys' blouses, knit underwear, and dress patterns. In November, 1937, it prepared a tentative draft of a proposed commercial standard for women's dresses.

Both the tentative draft and the earlier standard for dress patterns represent a "practical compromise" between various body measurements, the experience of dress pattern manufacturers, and retailers.

The universal adoption of the proposed commercial standard would have the effect of eliminating "confusion resulting from a diversity of measurements and methods." It would mean that consumers could know what size to ask for and what alterations to expect. But it would not mean that the best system of sizing which can be devised had been adopted, inasmuch as no system of sizes based on a really scientific study of body measurements has yet been tried, except, of course, that prepared by the U. S. Army, previously mentioned.

It was not until 1937 that money was obtained and definite plans formulated for a scientific study of body measurements, to be conducted under the supervision of Ruth O'Brien, of the U. S. Bureau of Home Economics.

The Bureau's project, which is now definitely under way, calls for the measurement of 100,000 children of both sexes at 11 age levels, 4 through 14, in eight selected regions of the United States. There is a possibility that six additional regions will be included in order to make the area covered even more representative.

With the idea of using this study to establish

[3] *Cost of Handling Merchandise Returns*, 1926. (Report of a special study of the problem by the University in cooperation with 27 Ohio department stores.)

[4] Quoted in *Consumer Viewpoint on Returned Goods*, p. 10, note 9.

an "American Standard" for sizes of children's garments, a sectional committee has been set up by the American Standards Association. The committee will work under the sponsorship of the American Home Economics Association. The standards for sizes of children's garments and patterns which the committee expects to develop will be based on the results obtained by the U. S. Bureau of Home Economics.

A staff of statisticians and trained anthropometrists is supervising the field work of the study. To assure a thorough understanding of the work and complete uniformity in procedure, the entire staff engaged in the actual work of taking body measurements has undergone an intensive training course. Living models are used in the training school and students must satisfy a minimum requirement for accuracy in measuring before they are sent into the field. For the further guidance of the measuring staff a 45-page manual dealing with equipment and procedure has been prepared. A system of "duplicate measurements" is used to learn of discrepancies and to obtain an estimate of error. As an additional precaution, all instruments used for measurement purposes are identical and checked by the National Bureau of Standards.

A few words regarding the technique used in analyzing the field schedules may be of interest. All sorting, tabulating, and summarizing of the schedules is done mechanically. Six large Hollerith machines are at work seven hours a day grinding out figures about the body dimensions of our child population. An office force is busily engaged in such operations as editing, coding, card punching, drafting, and operating calculating machines.

At the present time the emphasis of the work is on the study of interrelationships among the 36 body measurements taken. The nature of the analysis is quite technical, involving complex statistical measures. However, the net result will be summarized in a few simple tables giving the size norms which the analysis has shown to be most practicable.

Inasmuch as the children selected for measurement are representative of rural and urban communities in various sections of the United States, it will be possible to analyze differences in body proportions by region and degree of urbanization as well as by sex and age. Thus, if significant differences are discovered, manufacturers will be enabled to adjust their production accordingly. It is expected that analysis of the data will reveal certain key body measurements which will be more effective for sizing purposes than age. Whereas boys of identical age vary considerably in body dimensions, it may be, for example, that boys having an identical chest girth and height or weight would be similar in a great degree with respect to other body dimensions. Though chest girth, height, and weight were used here only for purposes of illustration, the actual dimensions which will best serve to predict the remaining body measurements may be revealed when the study is completed.

If the results of the study prove that a system of scientific body measurements provides a more practical and usable basis for children's clothing patterns and sizes than is provided by present methods, a great forward step for both consumers and industry will have been achieved. There will then be good reason to expect that the same technique when applied to the solution of the sizing problems in adults' ready-made clothing will be equally successful.

ASA Approves Standards For Oil and Pigments

Seven specifications and four test methods for linseed oil and pigments, primarily intended for use in paints, were submitted by the American Society for Testing Materials to the American Standards Association and approved recently as American Standards.

The specifications are:

Raw Linseed Oil (ASA K34-1937; A.S.T.M. D234-28)

Boiled Linseed Oil (ASA K35-1937; A.S.T.M. D260-33)

Bone Black (ASA K36-1937; A.S.T.M. D210-30)

Chrome Oxide Green (ASA K37-1937; A.S.T.M. D263-28)

Titanium Barium Pigment (ASA K38-1937; A.S.T.M. D382-35)

Titanium Calcium Pigment (ASA K39-1937; A.S.T.M. D383-35)

Titanium Dioxide (ASA K40-1937; A.S.T.M. D384-36)

Test for Specific Gravity of Pigments (ASA K41-1937; A.S.T.M. D153-27)

Coarse Particles in Dry Pigments and Coarse Particles and Skins in Mixtures of Pigments and Vehicles (ASA K42-1937; A.S.T.M. D185-37)

Routine Analysis of Titanium Pigments (ASA K43-1937; A.S.T.M. D186-37)

Routine Analysis of Yellow, Orange, Red, and Brown Pigments Containing Iron and Manganese (ASA K44-1937; A.S.T.M. D50-36)

Copies of the standards may be ordered from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, or from the American Standards Association office, at 25 cents each.

Are Shoe Standards Practical? New Committee to Study Question

IS IT practical to set up standards for lasts, materials, construction, and terminology of shoes? This is the question which will be studied by a new subcommittee, just appointed by the Advisory Committee on Ultimate Consumer Goods of the American Standards Association. A most important part of the subcommittee's work will be contacts with orthopedists, and with manufacturers and users of shoes.

Dr. Louise Stanley, chief of the Bureau of Home Economics, U. S. Department of Agriculture, has been named chairman of the subcommittee. Other members are:

Mrs. J. J. Doggett, secretary, General Federation of Women's Clubs

C. W. Dorn, J. C. Penney Company

R. W. Frey, Bureau of Chemistry and Soils, U. S. Department of Agriculture

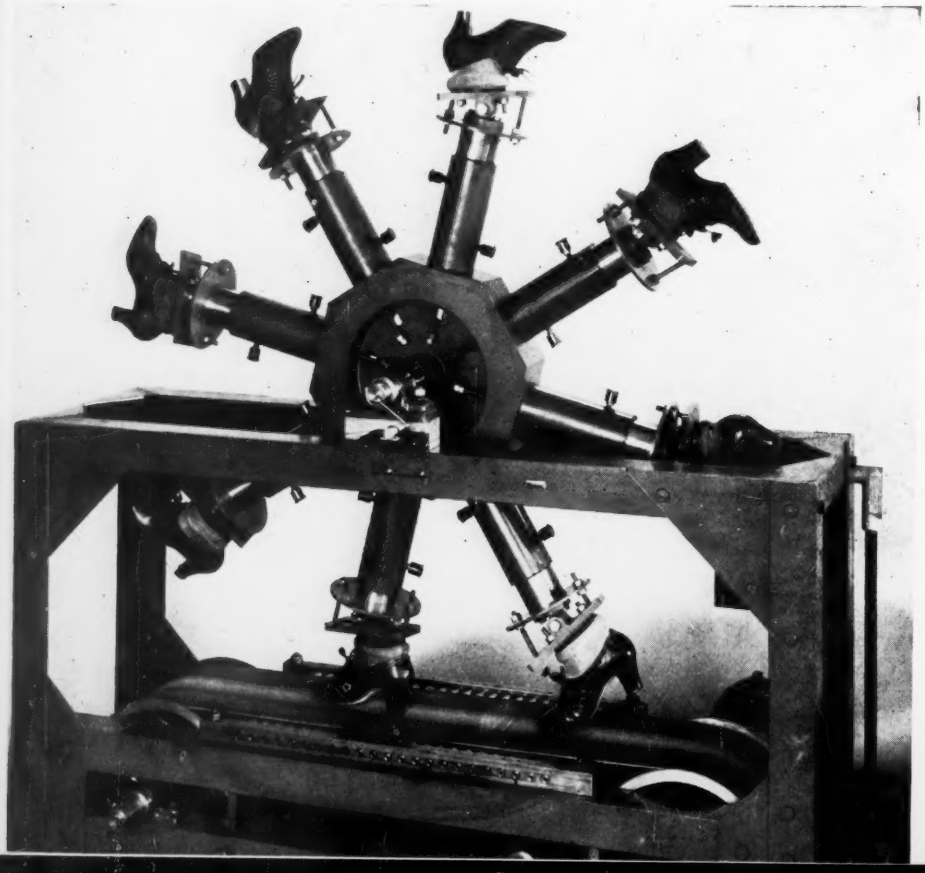
W. E. Emley, National Bureau of Standards, U. S. Department of Commerce

Miss E. S. Weirick, Sears-Roebuck Company

Length and width measurements are standardized for all sizes of shoes but these measurements cannot be depended upon by customers because of the variation in other shoe measurements, discussions by previous committees indicate, says Dr. Stanley. Variation in widths due to the elasticity of the shoe material, and differences in the conditions under which a shoe is made, also tend to confuse the purchaser, according to these discussions.

"Lasts are made in an almost unlimited variety of styles and combinations, each of which requires a large number of measurements," Dr. Stanley explains, "and we have no method of designation which can be used to convey the sum of all these measurements as a basis for understanding between buyer and seller. This is especially true of women's dress shoes. In the same nominal size and width, there may be a very considerable variation in such important factors as length of vamp, height of arch, pitch, width of heel, and the like, which vitally affect the fit."

A previous subcommittee which studied the subject found that the difficulty of preparing standards for shoes gave "little hope of materially as-



How the National Bureau of Standards studies the wearing quality of shoes. This machine simulates actual conditions of use.

sisting consumers at this time" but recommended that consumers be educated to know how to obtain a proper fit. A report of research work on shoes now being carried on at the National Bureau of Standards was studied by this subcommittee in making its report.

Study Is Printed

This study, *Shoe Constructions*,[1] by Roy C. Bowker, just published by the Government Printing Office, concludes that quality of materials and standards of workmanship are the factors which determine how a shoe wears, and that the method of construction of the shoe does not necessarily have any bearing on wearing quality. The circular contains brief descriptions of 40 individual shoe constructions, classified under eight main classes: welt, McKay, Littleway, turn, stitchdown, nailed, cemented, and moccasin.

In explaining how his conclusions were reached, Mr. Bowker says:

"The first work consisted in testing shoes for the purpose of finding out whether the type of construction influenced the ability of the shoe to hold its shape and resist general breakdown. Welt, cement, McKay, and Littleway constructions were run on the apparatus until 1,000,000 steps had been taken by each shoe. No general breakdown or serious change in shape occurred in any shoe. The same materials and the same standards of workmanship were used in making all of the shoes. Thus shoes of four different constructions stood up equally well while making 1,000,000 steps under normal conditions of load and flexure.

"Tests on shoes of lower grade than those used in the first series have been made and breakdown of essential parts of the shoes occured after 35,000 steps. The failure was caused mainly by the nature of the materials used."

British Base Proposed Shoe Sizes On Standard Heel-to-Ball Proportions

RECOMMENDING that two rules be used as the basis for standardizing sizes of women's shoe lasts, the British Committee on Standardization of Last Markings recently completed preliminary work on a study of shoe sizes. The two proposed rules are:

1. **Heel-to-ball length for a standard size 4 woman's shoe last should be 6⅓ in.; the scale intervals per size should be 7/30 of an inch.**
2. **Girth measurements at the ball of the foot should be designated by letters; size 4D has a girth measurement at the ball of 8 in.**

The present British scale of shoe sizes starts at 4 inches for size 0, 4-and one-third in. for size 1, and increases by one-third inch for each size. The American scale starts at 3-11/12 in. for size 0 and increases ⅓ in. for each size. In the United States the girth of the foot at the ball joint is not customarily measured; instead, the width of the foot at this point is the customary measurement taken by shoe salesmen.

The British committee found that the size of shoe lasts could not be determined simply with the size stick. The most obvious point at which the foot and the shoe last must correspond, they decided, is at the ball of the foot, hence the heel-to-ball measurement of the foot must be the same as that of the last. It was found that on the average the heel-to-ball length, measured from the rearmost point of the heel at a distance of ¾ inch from the base, is 7/10 of the foot's length. Although there are feet with toes proportionately longer or shorter, the committee concluded that in standardization it is necessary to work as nearly as possible to average conditions.

Standard Measuring Instrument

As a part of its work the British committee has developed an instrument to take last and foot measurements so that the heel-to-ball length will be obtained accurately.

The Committee for Standardization of Last Size Markings is now circulating its report with a questionnaire to the industry to determine whether its work so far has the approval of the trade. A copy of the committee's report, issued jointly by the Incorporated Federated Associations of Boot and Shoe Manufacturers of Great Britain and Ireland, and the British Boot, Shoe, and Allied Trades Research Association, may be borrowed from the American Standards Association.

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[1]Copies of *Shoe Constructions*, National Bureau of Standards Circular C419, are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

New British Standards Available to ASA Members

For the use of ASA Members, the American Standards Association Library keeps a file of foreign and domestic standards which may be borrowed or ordered. New British Standards just received include:

Cast-iron boilers for central heating and hot water supply, 779-1938
Chemical analysis of butter, 769-1938
Chemical analysis of cheese, 770-1938
Driers for paints—Paste driers, 331-1938; Liquid driers, 332-1938
Electric signs and luminous-discharge-tube installations, 559-1938
Electrodes for metal arc welding in the construction of ships, 782-1938
Extenders for paints—Asbestine, 255-1938; Barytes, 260-1938; Blanc fixe, 281-1938; Silica, 301-1938
Film-strips, film slides, and sub-standard glass slides, 777-1938
Flame-proof air-break electrically-operated gate-end boxes, 787-1938
General grey iron castings Grades A and C, 321-1938
High-duty iron castings Grades 1, 2, and 3, 786-1938
Materials for use in the manufacture of magnesium oxychloride flooring compositions, 776-1938
Metal-sheathed paper-insulated plain annealed copper conductors for use in mines, including voltage tests, 760-1938
Nickel silver sheets and strip of 10 to 30 per cent nickel content, 790-1938
Riveted steel boilers for hot water central heating and hot water supply, 780-1938
Rolled steel bars and hard-drawn steel wire for concrete reinforcement, 785-1938
Japanese and/or Korean Sardine oil (pale), 783-1938
Steel tubes and tubulars, gas (light), water (medium), and steam (heavy) qualities, 789-1938
Switchgear bus-bars, main connections, and auxiliary wiring, 158-1938
Testing of chemical stoneware, 784-1938
Venetian red for paints, 370-1938
Wrought-iron bars "special" grade, 762-1938
Wrought-iron tubes and tubulars, gas (light), water (medium), and steam (heavy) qualities, 788-1938

Orders for copies of these standards should refer to the British Standard serial numbers.

ASA Asks Industry's Comments On Rules for Rounding Decimals

A draft of a proposed American Recommended Practice giving rules for rounding decimal values as a guide in making conversions from inch to millimeter values and vice versa has now been completed and is being sent out to organizations interested for their approval. The rules given in this draft are the same as those published in the American Standard Inch-Millimeter Conversion for Industrial Use (B48.1-1933) but they are supplemented by an explanation and examples showing how to apply them.

It is expected that in this form the rules will become more widely known and in time will be generally applied by all scientific and technical workers.

The publication of the rules in a separate document was proposed by the general conference of industry representatives which recommended in 1933 that the American Standards Association submit the standard on inch-millimeter conversion to American industry for comment and criticism. The suggestion was made because the rules for rounding decimal values have a wider use than the conversion of inches to millimeters or millimeters to inches.

1937 *Proceedings* Show Activities Of All A.S.T.M. Committees

Information on standardization and research programs of all committees of the American Society for Testing Materials is given in the *Proceedings* of the 1937 A.S.T.M. annual meeting just published. The book is in two volumes, Part I covering committee reports and all new tentative standards approved this year; Part II giving the technical papers presented at the meeting.

Part I includes annual reports of 46 committees including some sectional committees, organized under ASA procedure for which the A.S.T.M. is sponsor. A number of these reports include papers covering important phases of committee work or related activities. These include:

Corrosion of Iron and Steel (Wire Test Program)
Fatigue of Metals (Nomenclature for Various Ranges in Stress in Fatigue)
Effect of Temperature on Metals (Long-Time Creep Tests; Discrepancies in the Load-Carrying Abilities of Carbon Steels at 850 F)
Die-Cast Metals and Alloys (Brass Die Castings; Die Design Changes and Test Bars)
Light Metals and Alloys (Modulus of Elasticity; Methods of Testing Oxide Coatings on Aluminum)
Report of Committee C-9 on Concrete and Concrete Aggregates (Plastic Mortar Cubes)
Electrical Insulating Materials (Significance of certain tests)
Methods of Testing (Various Tests Applied to Sheet Metals; Yield Strengths Corresponding to Small Percentages of Set)
Spectrographic Analysis (Super-Purity Metals)

Part I also contains all tentative standards first published in 1937 and all proposed revisions of standards.

Part II includes the Edgar Marburg Lecture on Plastics, the symposium on significance of tests of coal and extensive groups of papers on metals and cement, concrete, masonry materials, etc., several

papers on asphalt and related materials and a group of papers on water, particularly boiler feedwater, as well as other papers on testing methods.

Copies are available from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa., at $12.00 for the complete book; $6.00 for each volume.

German Standards for Welded Highway Bridges

New German Specifications for Welded Steel Plate Girder Highway Bridges (DIN 4101), adopted in 1937, are now available in the office of the American Standards Association. These specifications are based on the Specifications for Welded Railway Bridges (DIN 4100) adopted in 1935.

The specifications provide, in brief:

Materials. Mild and low-alloy structural steels that are permissible for riveted construction are satisfactory for welding. Welding rod must pass the requirements of DIN 1913.

Arc (direct-current or alternating-current) gas, arcogen, and electric resistance processes may be used.

Design of welds is the same as in DIN 4100. Prominence is given to the use of T bars and ribbed and nose-profile flanges.

Requirements for design of specific parts are included.

For design stresses for welds in welded highway bridges, according to the new standard, the figures are the fraction of the permissible design stress for unwelded base metal.

The standard provides requirements for structural details (stiffeners, angles of fillets, etc.).

The requirements for welding procedure repeat the usual precautions such as removal of rust. The end fillets at the ends of flange plates in low-alloy structural steel carrying a tensile stress of 24,200 psi or over must be machined. If the flange plate is thicker than 1 inch it must be tapered (1 in 10) to a thickness of 1 inch at the ends. As much welding as possible should be done in the shop. In order to reduce shrinkage stresses, rigid welding should be avoided.

The standard also includes requirements for inspection, and for qualification of welders using standard test specimens of the material to be welded.

Copies of the standard may be borrowed or ordered from the American Standards Association.

Curricula on Safety Is Purpose Of New University Course

Secondary and elementary schools, teacher-training institutions, and city and State departments are now being faced with the problem of developing courses of study for the promotion of safety. Because of the need for specialized knowledge on the subject, a course in safety is now being offered by New York University, in collaboration with the National Conservation Bureau. Two points credit will be given toward the School of Education degrees. The course is called Materials and Methods of Teaching Safety, and includes laboratory periods and field trips. Its purpose is to give an opportunity to plan and develop courses of study, curricula, and other procedures for the promotion of safety. Seminars will be held to develop curricula suited to the special situation in which the student teaches.

Dr. Herbert J. Stack of the National Conservation Bureau will direct the course.

Use of Standards Returns Dividends on Work

Specifications are somewhat in the class of toy trains. One can spend hours during the holiday season preparing a platform, erecting figures, and hooking the train up electrically, but if the train is not operated, we would consider most of the effort misplaced. Likewise with standards. A great amount of time, money, and effort can go into the drafting of a standard specification or test, but dividends from the investment will come only if the specification comes into definite use.—*Bulletin of the American Society for Testing Materials, January.*

Recommend Commercial Standards On Insecticides, Disinfectants

Five recommended commercial standards on insecticides and disinfectants are now being circulated by the Division of Trade Standards, National Bureau of Standards, for acceptance by those interested. The standards are:

Liquid hypochlorite disinfectant, TS-2460
Pine Oil disinfectant, TS-2461
Coal tar disinfectant (Emulsifying type), TS-2462
Cresylic disinfectants, TS-2463
Household insecticide (Liquid spray type), TS-2464

Consideration of the standards for adoption as Commercial Standards was requested by the National Association of Insecticide and Disinfectant Manufacturers, Inc.

Copies of the proposed standards may be obtained from the Division of Trade Standards, National Bureau of Standards, Washington, D. C.

Determining top burner thermal efficiency of a domestic range for use with bottled gas

Consumer Standards Hold Hope For Future, Gas Industry Finds

by

Franklin R. Wright

Manager, Publications Department, American Gas Association Testing Laboratories

DURING the past few years there has been a greatly accelerated interest in consumer buying and consumer protection. There has probably been more talk on this subject during the last four or five years than during any previous period in the history of the country. The question arises, "What is the reason for this aroused interest on behalf of the ultimate consumer?" Have consumers suddenly become effectively organized with prospects of sit-down strikes to enforce their demands for better products at less cost, or is there some other cause for the present concern?

An analysis of the situation would seem to indicate that direct consumer organization has little to do with the wide interest in this subject now being displayed. There are two factors which seem to have contributed largely to the present situation, neither of which was brought about directly by the consumers themselves.

First, increased competition between the many producers of similar products has resulted in more extensive advertising of products to the public than has heretofore taken place. While printed advertising has shown a decided increase, radio advertising has probably been the most effective means of creating interest in consumer products and standards by which they may be judged.

The second contributing factor, which seems to be of importance, is the attitude of the Federal Government in recent years in matters of interest to consumers.

While there has been a lot of talk and a great deal of interest aroused in consumer buying and customer protection, there must be more than this

Gas industry's experience shows authoritative consumer standards benefit both producer and user; American Standards Association approves gas appliance committee as nationally representative, competent to agree on national standards as basis for performance test

96 per cent of all gas appliances carry the A.G.A. Seal of Approval, assuring the consumer that the gas appliance he buys meets standard performance requirements

if the consumer is to be ultimately benefited. Unfortunately, false prophets and self-styled champions of the cause of the consumer frequently find this subject an effective vehicle to win political fame and fortune.

I believe that there are few who will deny the desirability or need of consumer standards and buying guides for the public. However, there is a grave danger that with the increased popularity of this topic of discussion, ineffective or misleading standards may be developed which in the end may prove a detriment rather than a benefit.

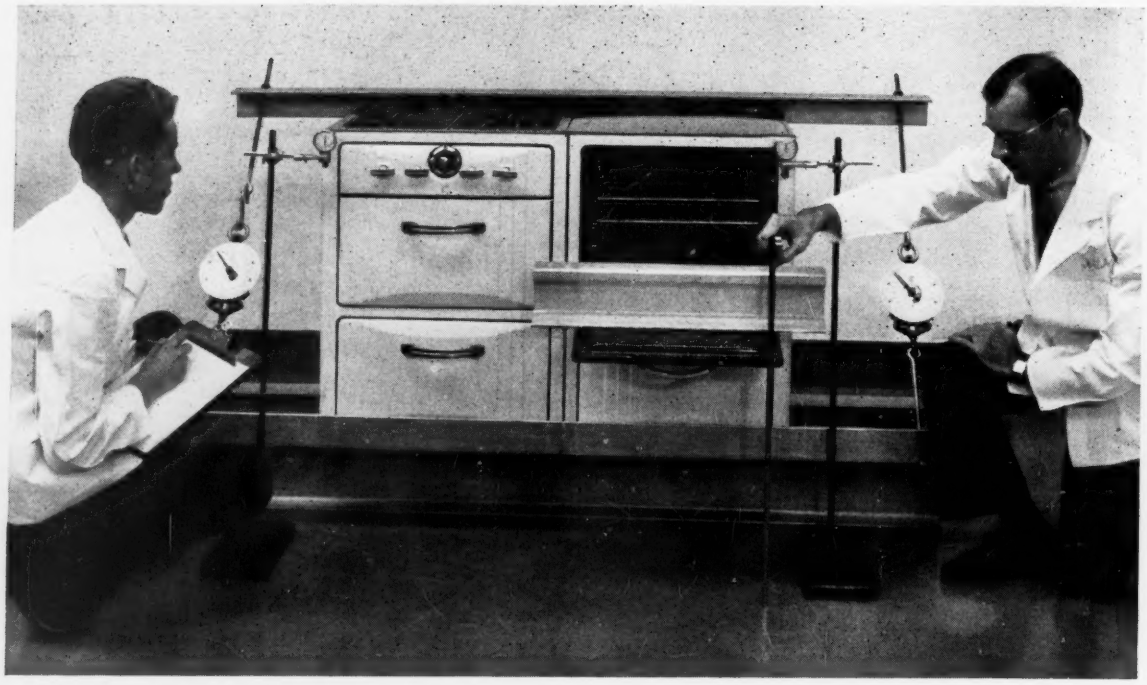
It is only with competent representation of all interests concerned and due regard for all the factors involved that a practical program of standardization can be worked out and made effective. It is indeed fortunate that we have in this country an organization such as the American Standards Association, whereby authoritative and truly representative standards that really mean something can be promulgated. The American Standards Association has been doing an outstanding job in the field of industrial standards for many years and it is expected its work in the field of consumer standards will be equally effective.

There are some, of course, who have a direct interest in the standardization of products who take the attitude that effective work along this line is an impossibility. I am reminded, however, of the poem written by that popular American poet and philosopher, Edgar A. Guest, which says:

"Somebody said that it couldn't be done,
But he with a chuckle replied
That maybe 'it couldn't', but he would be one,
Who wouldn't say so 'til he'd tried.
So he buckled right in
With the trace of a grin on his face.
If he worried he hid it.
He started to sing
As he tackled the thing
That couldn't be done, and he did it."

There is no more effective proof that comprehensive authoritative standards can be developed

An American Gas Association Testing Laboratories' engineer inspects a gas range on the production line (in foreground). A typical scene in a gas-appliance manufacturing plant.



(Above).—Testing a domestic gas range body and oven door for strength

(Below).—Every appliance is tested with all burners operating to determine its effect on floor and wall temperatures

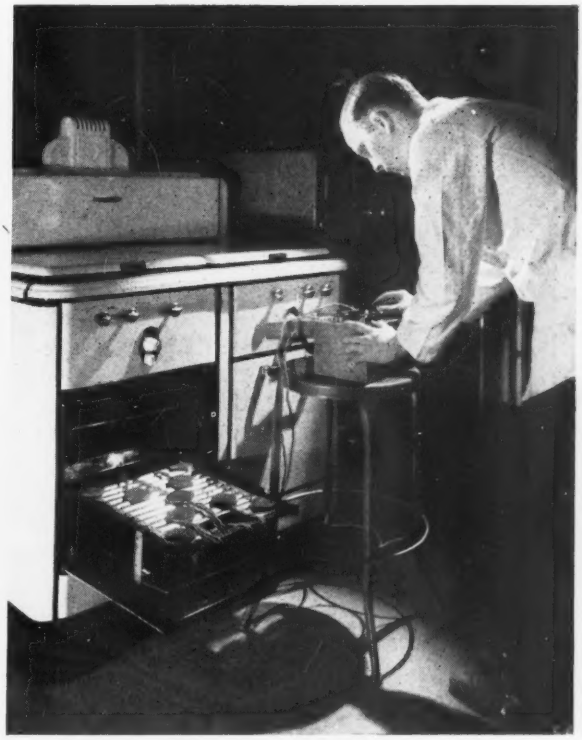
than the experience of the American gas industry in this field during the past twelve years. Not only has the American gas industry, through the cooperation of governmental bureaus, consumer organizations, technical societies, and others, developed standards for practically all types of domestic, and several commercial, gas appliances, but it has gone further and actually enforced these standards through the testing of appliances in national laboratories. It has further followed through this program by means of a system of field and factory inspections year after year for more than a decade.

In spite of this work, we occasionally find that when an attempt is made to expand this program to include other classes of equipment someone still says, "It can't be done," on the ground that the equipment under consideration may have varying peculiarities as to design or use. This attitude, however, is analogous to the man who had heard about a giraffe but hadn't seen one and wouldn't believe such animals existed. When eventually he had an opportunity to see one in a zoo, he still said that he didn't believe it.

The American Gas Association, through continuous painstaking research at its research laboratories in Cleveland and at the National Bureau of Standards in Washington, has developed a group of some 26 standards for gas appliances, all of which are approved as American Standard by the American Standards Association, and are looked upon as the most comprehensive set of engineer-

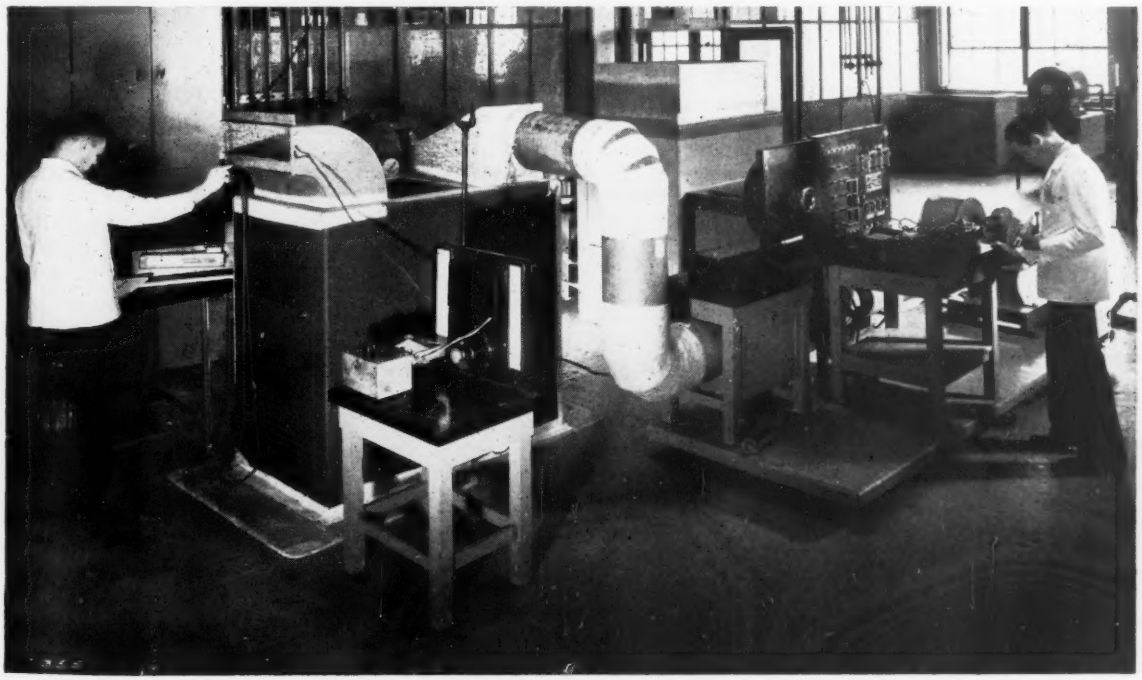
ing standards for ultimate consumer goods ever developed.

These standards have been prepared under the jurisdiction of the committee originally known as the A.G.A. Approval Requirements Committee, which since 1930 has been a sectional committee, Project Z21, of the American Standards Association. This group includes representatives from such organizations as the National Bureau of Standards; U. S. Bureau of Mines; U. S. Public Health Service; U. S. Bureau of Home Economics; American Home Economics Association; National Safety Council; American Institute of Architects; Master Plumbers Association; Heating, Piping and Air Conditioning Contractors National Association; Associated Factory Mutual Fire Insurance Companies, as well as engineers and executives representing manufacturers and gas companies including the American Gas Association, Canadian Gas Association, Association of Gas Appliances and Equipment Manufacturers, Compressed Gas Manufacturers Association and the Liquefied Petroleum Gas Association. This main committee has some 32 standing subcommittees, one for each type or class of equipment. All in all, the total membership of these groups, representing every



(Above).—This test for broiler temperature is only one of more than 500 tests that a domestic gas range must meet before it is approved

(Below).—Testing the efficiency of a gas warm-air furnace and air conditioning unit at the main testing laboratory of the American Gas Association in Cleveland



Wide Representation Gives Committee National Status

The inclusion of such groups as the American Home Economics Association, American Institute of Architects, and the National Safety Council, as well as manufacturer and government representatives, gave national status to the American Gas Association's Approval Requirements Committee and made possible acceptance of its membership as a sectional committee by the American Standards Association. Since organization of the sectional committee in 1930, twenty-six standards for gas-burning appliances, including such various items as gas stoves for home use and gas hair dryers for beauty parlors, have been worked out by this committee and have been approved by the American Standards Association.

The committee, which has the approval of the American Standards Association as a nationally representative committee, works under the leadership of the American Gas Association. Its membership includes:

R. B. Harper*, American Gas Association, *Chairman

R. M. Conner*, American Gas Association Testing Laboratory, *Secretary

American Gas Association, *E. L. Hall, R. B. Harper, W. S. Walker, H. E. G. Watson, L. B. Wilson, W. W. Winter, C. C. Winterstein*

American Home Economics Association, *Mrs. Katharine M. Ansley*

American Institute of Architects, *Theodore I. Coe*

Associated Factory Mutual Fire Insurance Companies, *George W. Brahmst, George M. Wile (alt.)*

Association of Gas Appliance and Equipment Manufacturers, *Frank H. Adams, W. E. Derwent, Lyle C. Harvey, B. B. Kahn, Harold Massey, E. L. Payne, F. E. Sellman, A. Stockstrom*

Heating, Piping, and Air Conditioning Contractors National Association, *George P. Nachman, Frederic R. Ellis (alt.)*

National Association of Master Plumbers of U. S., *J. L. Murphy*

National Safety Council, *Katharine M. Ansley, Curtis Billings (alt.)*

U. S. Department of Agriculture, Bureau of Home Economics, *Dr. Louise Stanley, Helen A. Holbrook (alt.)*

U. S. Department of Commerce, National Bureau of Standards, *E. R. Weaver*

U. S. Department of Interior, Bureau of Mines, *George W. Jones*

U. S. Treasury Department, Bureau of the Public Health Service, *Dr. R. R. Sayers*

section of the United States and the Dominion of Canada, totals around 300 engineers, executives, and governmental officials.

While at the present time there is a great deal of interest in consumer protection through the standardization of ultimate consumer goods, the American gas industry has been carrying out a program of this kind for more than 12 years. That is has been eminently successful and worthwhile from the standpoint of consumers, producers, and utilities alike is beyond question.

Millions in Gas Business

The gas business of the United States is one of the greatest American industries. The total investment in this business exceeds by many millions the amount of capital employed in the production of steel, which has long been considered one of the most basic industries in the United States. While some four billion four hundred million dollars have been invested in the steel plants of this country, almost five billion dollars of capital is required to provide gas service to the seventeen million customers of the United States. Today, towns and cities with a population of more than eighty million people depend upon gas service as a daily necessity. In addition, there are hundreds of thousands of others living in rural and sparsely populated communities beyond the reach of gas mains which have the benefit of this service through the medium of liquefied petroleum gases, commonly known as bottled gases.

What has been accomplished by the gas industry, therefore, in the field of consumer standards, represents no small undertaking. It was the first of any great American industry to undertake self-imposed regulation in the public interests whereby national standards were developed and then rigidly enforced by national testing laboratories. That the producers of gas equipment and the gas utility companies actively cooperated in making this program effective is evidenced by several points which may be of interest.

Member Companies Agree to Use Standards

In October 1926, the American Gas Association, in convention assembled, went on record to the effect that no gas appliances for which approval standards had been developed would be sold or offered for sale by any member gas company unless they bore the Seal of Approval of the Association's Testing Laboratories. In 1931, to further make this program effective, the American Gas Association drew up a set of merchandising principles for all cooperating agencies selling or in-

terested in the sale of gas appliances, including utility companies, and various types of dealer agencies. The first of these principles states in effect that "Gas appliances offered for sale shall bear the Seal of Approval of the American Gas Association's Testing Laboratories." The gas companies of the United States with practically no exceptions have adhered strictly to this principle and, further, have secured the cooperation of local dealers in making it effective. Today approximately 96 per cent of all gas appliances sold in the United States and Canada bear the Laboratory Seal of Approval, indicating that they have been tested and found to comply with published American Standards. Translated into actual numbers, this indicates that approximately 1,450,000 of the 1,600,000 domestic gas ranges sold last year in the United States had been tested and certified in accordance with national consumer standards. This same proportion holds true for the hundreds of thousands of other domestic and commercial gas appliances, including such as various types of water heaters, room heaters, house-heating boilers and furnaces, hot plates, laundry stoves, clothes dryers, unit heaters, etc.

The gas industry's appliance testing and approval program is one of regulation rather than one which decides just what the manufacturers must make and what the ultimate consumer must use. Furthermore, there is nothing in this program which disregards the interest of some at the expense of others, except insofar as this is necessary to insure safety, efficiency, durability, and all around better merchandise for the consumer at a minumum cost. To this extent any temporary hardship that has been imposed on producers has eventually worked out to their benefit.

Producers Cooperate

Under this plan, the program has secured the cooperation of producers and has brought benefits to the consumers as, I believe, no other form of undertaking could. It is an example of a case where an industry has translated its good faith into definite action which has benefited not only itself but has proven of inestimable value to the ultimate consumer.

The success of this undertaking in the United States and Canada has been recognized by several foreign countries to the extent that some have installed similar systems. Among the most noteworthy is the one in Australia which is patterned almost completely after the American system.

It effectively demonstrates that industry and the consumer can get together on common ground and work out an effective program for the ultimate good of each without coercion or unfavorably affecting one another's interests. In fact such programs, if properly conceived and applied, in my opinion hold more hope for contributing to our economic welfare than any one factor now visible on the business horizon.

Many National Organizations Work for Consumer Standards

"For many years several national organizations such as the American Home Economics Association, National Federation of Women's Clubs, National Bureau of Standards, U. S. Bureau of Home Economics, and others, have been going quietly about the business of educating buyers and bringing about an evolution in the attitude of consumers with respect to the purchase of goods. These organizations have accomplished a great deal through the dissemination of information to consumers and by giving them, in many cases, at least a partial guide for buying. Very recently the American Standards Association has extended its activities to include the development of standards for consumer products."—*Franklin R. Wright.*

N.F.P.A. Compiles Safety Data On Flammable Liquids and Gases

The 36 standards on flammable liquids and gases prepared by the National Fire Protection Association have now been published in one volume with the title, *The National Fire Codes*. These codes were prepared by the N. F. P. A. to give fire protection authorities information on the safe handling of both flammable liquids and gases. The codes are in the form of suggested ordinances, regulations, or recommended good practice requirements.

The N. F. P. A. has prepared some 150 standards on various phases of fire prevention and protection since it was organized in 1896. These standards are widely used as a basis of law, or as a guide by administrative authorities, as well as for insurance purposes.

Copies of the book may be ordered from the National Fire Protection Association, 60 Batterymarch Street, Boston, at $1.50 each.

Committee Plans Publicity Campaign For Iron and Steel Pipe Standards

THE importance of further educational efforts to promote the use of the American Tentative Standard for Wrought-Iron and Wrought-Steel Pipe (B36.10-1935) was emphasized at a meeting of the committee[1] in Rochester March 8. The committee's meeting was held in conjunction with the spring meeting of the American Society for Testing Materials, which with the American Society of Mechanical Engineers, has administrative responsibility for the work.

The committee found that practically all the pipe schedules in this standard are completely acceptable, and recommended that it be advanced to the status of American Standard instead of American Tentative Standard. The committee believed that this action would help to extend its use. Those present at the meeting agreed that the commercial acceptance of the standard has not proceeded as fast as desired, perhaps due in a large part to lack of information by jobbers and contractors as well as small users of pipe. Recently, articles have appeared in the magazines of the sponsors (the American Society for Testing Materials and the American Society of Mechanical Engineers), in INDUSTRIAL STANDARDIZATION,[2] and in trade publications. These articles were intended to familiarize the piping trade with the dimensional and material standards for which this committee is responsible.

The committee proposed that when the American Standards Association takes action on the standard, which may be in the fall of 1938, an intensive publicity campaign should be undertaken.

A readjustment from 0.375 to 0.437 in. in the wall thickness of the 16 in. outside diameter size in schedule 30, Tables 2 and 4, with corresponding changes in Tables 3 and 5 was recommended as the only technical change in the standard. For the sake of clarity the wording of two notes was changed slightly.

The committee also voted to include in Table 1, which is a listing of pipe specifications for various purposes, three A.S.T.M. standards: Seamless Alloy-Steel Pipe for Service at Temperatures from 750 to 1100 F, A.S.T.M. A 158-37 T; Seamless Carbon-Molybdenum Alloy-Steel Pipe for Service at Temperatures from 750 to 1100 F, A.S.T.M. A 206-37 T; and the A.S.T.M. standard, Electric-Fusion-Welded Steel Pipe for High-Temperature and High-Pressure Service, A.S.T.M. A 155-36. This third standard is to be sent to letter ballot of the sectional committee to determine whether it should be recommended to the ASA for approval as American Standard.

The first two standards listed, if and when adopted by the A.S.T.M., will also be sent to letter ballot of the sectional committee for submittal to the ASA.

[1]Sectional Committee on Standardization of Dimensions and Materials of Wrought-Iron and Wrought-Steel Pipe and Tubing (B36).

[2]"Why Not Use the American Standard for Steel Pipe?" by Sabin Crocker, INDUSTRIAL STANDARDIZATION, February, 1938, page 42.

A.S.T.M. Considers New Standard Following Galvanized Sheet Test

After inspecting the extensive outdoor tests on bare and galvanized sheets and hardware which have been carried on throughout the country under the supervision of Committee A-5 on Corrosion of Iron and Steel of the American Society for Testing Materials, the committee has proposed new tentative specifications covering galvanized sheets. These proposed specifications will be recommended to the A.S.T.M. for publication as tentative, with the probability that they will eventually supersede the existing standard specifications (A 93-27), covering sheets with five classes of zinc coatings prepared by the hot-dipped process.

In order to meet the demands for a test procedure for determining thickness of zinc coating on zinc-coated (hot galvanized) irregular shaped hardware, especially steel castings and forgings, and gray iron and malleable iron castings, the committee has developed a modified Preece test procedure which is to be referred to the Society for publication as tentative. In recommending the new method, the committee discussion made it clear that stripping methods as described in the Methods of Determining Weight and Uniformity of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles (A 90-33) should be continued for iron and steel hardware conforming to the general description of bolts, nuts, nails, etc., and other parts which have uniform or easily estimated surface areas.

ASA Authorizes Work On Bedding Standards

STANDARDS for bedding and upholstery will be developed by a committee working under the procedure of the American Standards Association, the ASA Standards Council decided when it voted recently to initiate the project. The work will include grades for filling materials, and labels to show their composition and quality, as well as to identify new and second-hand materials.

The new project was recommended to the American Standards Association by the Advisory Committee on Ultimate Consumer Goods which studied the problem for several months in 1937. The committee found during its study that 17 states, two cities, and the District of Columbia control the production and sale of bedding and upholstery through legal requirements. Many of the provisions in these regulations, intended primarily to protect consumers against second-hand or re-used material, vary, however, both in their technical requirements and in provisions for labeling, as well as in their administration. The resulting confusion has caused many difficulties in the manufacture and distribution of bedding and upholstered articles, and has resulted in irregular qualities and increased costs to the consumer, the committee found.

Requirements Vary

"Materials required to be described one way in some states are not permitted to be described that way in another," said J. Davis Donovan, president of the National Association of Bedding and Upholstery Law Enforcement Officials recently, in commenting on the situation. "As no precedents for testing materials had been established, each state worked out its own method of making analyses, and the same cotton which was new 'there' was classed as second-hand 'here.' The result is increasing confusion of manufacturers who attempt to comply with the many varying, and often conflicting, rulings. Inspectors and administrative officials often find themselves involved in efforts to eliminate purely technical problems, and the dishonest fellow has that much better chance to get by without detection."

The new project approved by the American Standards Association will cover:

> **Development of standards covering the identification and disclosing the percentage composition of the filling material; grades of such filling material; identification of the finished article to show whether it is in whole or in part made from new or second-hand material; methods of labeling to make this information available to distributors and consumers.**

The National Association of Bedding and Upholstery Law Enforcement Officials has been named to take the administrative responsibility for the work.

The Association has endorsed the proposed work, Mr. Donovan, president, informed the ASA, 15 of the 17 officials having said they were heartily in favor and the other two that they were not opposed.

Four manufacturing organizations have also endorsed the work:

Bedding Manufacturing Board of Trade
National Association of Furniture Manufacturers
National Bedding and Upholstery Manufacturers Board of Trade
New England Bedding Manufacturers Association

A committee representing consumers, retailers, manufacturers, and other groups concerned, will be named to work out the proposed standards and will submit them to the American Standards Association for approval.

Standardization in Conventions

"Our experience has shown that standardization techniques applied to the mechanical and regulatory aspects of an exhibit free the management for the kind of personal contact that counts."—*Henry Hoke, Executive Manager, Direct Mail Advertising Association, writing in "World Convention Dates," September, 1937.*

ASA Committee Starts Work On Standard "Approval" Methods

REPRESENTATIVES of nine national organizations met April 6 to organize a committee of the American Standards Association to set up standard methods and procedures for the guidance of testing laboratories and other public endorsement agencies. Thomas A. Wright of the Association of Consulting Chemists and Chemical Engineers was named chairman of the new committee, and B. L. Oser of the same organization was named secretary.

Need for this project arises from the increasing use by producers and distributors of "approvals," "certifications," and "listings" to satisfy the consumer demand for more factual information concerning quality of goods and performance of equipment offered for sale. These "certifications" are of great potential value to the buying public if backed by adequate tests of responsible agencies; but, according to the Association of Consulting Chemists and Chemical Engineers who proposed that the American Standards Association undertake this work, such tests are not always carried out.

"Irresponsible endorsements that claim significance which they do not possess," according to the Consulting Chemists and Chemical Engineers, are bringing the whole system into disrepute. Some vendors, the Association points out, cater to the consumer desire for facts by "asserting half-truths or by implications which have no real significance. In other cases there is no evidence of the existence of standards, and if they do exist they are not available to the public. Some vendors use 'certified' as a trade designation."

The proposal of the testing engineers and chemists, many of whom are heads of laboratories, has been heartily endorsed by the National Bureau of Standards, the National Association of Purchasing Agents, the American Home Economics Association, the Consumers' Division of the U. S. Department of Labor, and the American Society for Testing Materials.

The plan is to set up standard practices covering fundamentals which should underlie approval procedures—such standards to be developed cooperatively by consumers, producers, distributors, and advertisers, many of whom were represented at the meeting.

Among the points suggested for inclusion are: a clear statement of the auspices under which any plan of approval is operated; adequate independent sampling and testing of the product to determine its conformity with definite published standards; systematic re-examination to insure continuing conformity; records of test to be publicly available; and compliance with these principles to be indicated on labels or tags.

The following organizations were represented at the meeting:

American Society for Testing Materials
American Home Economics Association
National Association of Purchasing Agents
Consumers' Project, U. S. Department of Labor
National Bureau of Standards
Association of Consulting Chemists and Chemical Engineers
National Electrical Manufacturers Association
National Retail Dry Goods Association
National Federation of Textiles

In addition to election of officers, the committee authorized the appointment of a Subcommittee on Draft, which will start the technical work on development of the proposed standard.

Vertical Adjustment of Taper Shank Tools With New Standard

A standard to secure vertical adjustment for taper shank tools when used in multiple-spindle drilling heads was approved recently by the American Standards Association. This American Standard, Adjustable Adapters for Multiple Spindle Drilling Heads (B5.11-1937) is the eleventh in a series of American Standards for Small Tools and Machine Tool Elements prepared by a committee working under the administrative supervision of the Society of Automotive Engineers, the National Machine Tool Builders' Association, and the American Society of Mechanical Engineers.

The new standard is expected to bring about a considerable saving through permitting the transfer of spindles from old heads to heads of new design or the retention of such spindles in stock for repair purposes.

The work on the standard was started in 1932 by a technical committee on the Standardization of Multiple Spindle Drilling Heads, working under the Sectional Committee on Small Tools and Machine Tool Elements (B5).

Copies of the standard are available from the American Standards Association at 50 cents each.

Standardization Principles Make Possible Mass Production of Diesel Engines[1]

High precision and interchangeable parts feature application of standardization technique

One basic cylinder size and design is adapted to all applications of Diesel power—tractors, trucks, buses, stationary power plants, industrial and road building machinery

A COMPACT, highly efficient plant designed exclusively for the production of high-speed Diesel engines on a mass production basis became the local point of engineering attention when General Motors Corporation threw open to the inspection of technicians the new plant of its Detroit Diesel Engine Division.

Questions long debated in Diesel circles have been answered—small, high-speed Diesel engines are practical, they can be built economically by mass production methods, and they can be built by that method according to standards even more exacting than the high requirements of the mass-production automobile industry.

Perhaps the most important fact about the new plant is that its manufacturing facilities are to be devoted exclusively to the building of an integrated line of industrial Diesel high-speed engines readily adaptable for all manner of applications of Diesel power—for stationary power plants, for industrial and road building machinery, for tractors, trucks, and buses. The plant will produce four engines built around one basic cylinder size and design—a one cylinder engine—a three cylinder engine, a four, and a six. All are designed on the two-cycle principle so that the power development of each engine is approximately equivalent to a corresponding engine of double the number of cylinders made on the conventional four-cycle principle.

Precision Is Keynote

Culminating many years of development and experimental production, the keynote of this operation is *Precision*, precision of an order hitherto unknown in mass production. As the details of the manufacturing procedures are unfolded, one will appreciate how the most modern production machinery, some of which had to be specially designed and built for the specific purpose, has placed the most exacting machining operations on a basis that is exact and reproducible and subject to conventional production controls. In effect, the individual skills of the finest instrument makers have been mechanized so as to produce interchangeable parts on a mass production basis within tolerances to which no hand-skill can ever aspire.

Within the structure of the various Diesel engine units of General Motors Corporation, announced recently, it is of interest to note that the Detroit plant is the focal point for coordinated engineering and test facilities for all plants in the new set-up. The engineering department designs all Diesel engines developed for the Corporation while the testing laboratory contains personnel and equipment for carrying on this work for the entire group.

Precision operations are keynoted in the machine shop. Here will be found the most modern of the precision boring machines, diamond-boring machines, centerless grinders, honing machines,

[1]Abstract of article, "Mass Production of Diesel Engines Made Possible By Setting Up Highly Efficient Plant," *Mill and Factory*, February, 1938.

Production and experimental models of fuel injectors are kept under constant test in machines such as this at the Diesel Test Laboratory. Operated by an electrically driven cam-shaft, the plungers of the four injectors shown are being forced up and down more than 3,000,000 times a day as the engineers attempt to discover any weaknesses in design or construction. The injection pressure at this rate of speed is 50,000 pounds.

and similar equipment associated with precision manufacture.

One of the most important of the precision operations is that of producing piston and connecting rod assemblies. In most cases of automotive engine production, these assemblies are permitted to vary between fixed limits and then are assembled into balanced sets by selective matching of pistons and rods. At the Detroit Diesel plant this procedure is not tolerated. Each of the parts is interchangeable as to size and weight with its fellows and each assembly conforms to the same weight specification. This is achieved by the use of ingenious machines which automatically weigh the piston or the rod and machine it precisely to the weight required.

Outer diameters of pistons and cylinder liners are finished to close limits both as to size and surface quality by operations on centerless grinders—huge machines of the very latest type.

Connecting rods not only are precision-bored to achieve the desired control of size and roundness but are subsequently honed to produce the desired surface finish.

The interchangeability mentioned earlier finds its best expression in the machine lines for the large units such as cylinder blocks and heads. Consider that such equipment is most expensive as to first cost and requires, in addition, expensive jigs and fixtures for the character of precision demanded here. Here is one of the best examples of the coordination of engineering design and production planning to be found anywhere. Cylinder blocks and cylinder heads are so designed as to be geometrically similar for all sizes and end-for-end. What this means is that no matter how you turn the casting, both ends have the same shape and take the same number and spacing of holes. Moreover, the ends of all blocks whether they have one, three, four, or six cylinder barrels, are precisely alike; and the drilling of the top and bottom is the same save for the fact that a larger block will have more holes.

This basic conception of design makes it possible to use but one line of special machines for the entire range of engines no matter what number of cylinders. Yes, it even goes further since the similarity of the blocks makes it possible to

use many fixtures interchangeably and utilize multiple-spindle drilling and tapping heads[2] without change.

How completely this philosophy has penetrated production planning may be gauged by the set-up for boring the dry cylinder liners which are assembled into the engine barrels. For boring, the liners are assembled, three at a time, into a huge fixture which has the same form and size as a three-cylinder, cylinder block. Then the fixture with its charge of liners goes into the same machine and same fixtures as are used for boring the cylinder barrels. The only change required is to replace the boring cutters with cutters of smaller diameter, a matter of only minutes for the changeover.

Simple Equipment—Intricate Process

The blower department is a gem of perfection and mechanical ingenuity, and probably the first of its kind in this country. Its chief attribute is the simplicity of equipment and process for an operation so intricate and precise. Several examples will suffice to give the picture. For example, the blower housing has two bores that must be finished to accurate limits. This is done by boring the housing on a single-end precision boring machine with its massive boring spindle. As one bore is finished, the table indexes the work forward, hydraulically, to complete its mate. However, this is but a roughing operation. Subsequently, each housing is processed in the same machine for a second and final boring operation.

Machining of the blower rotor is a very unique operation. The rotor is a three-lobed affair, each lobe having a spiral form along its axis. There is one specially designed machine set up to handle this operation automatically. It takes three separate settings of the rotor to complete the job, using a special formed cutter that encompasses a third of the profile each time. As the cutter traverses the face of the rotor, the rotor casting is automatically turned by an indexing mechanism so as to produce the spiral form.

After machining, each rotor goes to a balancing machine where it is checked and drilled if necessary to produce the described limits of balance.

A striking note of modernity is found in the installation of a new type of equipment for heating flywheel ring gears. This machine heats the rings by electric induction thus discarding the previous practice of heating by flame or in a furnace.

Crankshafts are checked 100 per cent for static and dynamic balance using the standard GMR balancing machine. However, a distinctive feature of this machine quite in keeping with the production thinking in this plant is the fact that it also is used for balancing flywheels.

The plant also has a modern and well-equipped heat treating department together with a metallurgical laboratory.

With these high-spots of the machine shop, we turn naturally to the Precision Manufacturing Department—in a niche all its own—which produces the fuel injectors for all Diesel engines built by General Motors. In its present form it represents the hitherto unattainable objective of translating the skill of the instrument maker into mechanized operation that achieves unbelievably precise manufacturing limits in interchangable and reproducible parts—something that transcends human skill.

One may gain a good picture of what has been accomplished by considering a few of the measurements that are made mechanically.

[2]The American Standards Association recently approved an American Standard for taper shank tools to permit vertical adjustment for these tools when used in multiple-spindle drilling heads (see page 94).

Diesel Plan Shows Standardization Soundly Applied

Principles of soundly applied standardization are demonstrated in the plan described in this article.

Strictness **governs where parts must be held between close manufacturing limits.**

Contrasting with this strictness, is the maintenance of maximum *flexibility*. Basic units are assembled into various combinations. Four engines are built around one cylinder size.

Strictness and flexibility together give a delicate balance between stability—needed for proper planning — and adaptability—needed to revise the plan readily.

This article shows what can be done through coordination of engineering and testing facilities, and coordination of engineering and production planning.

There is no better argument for the value of standardization—the key to coordination—than standardization practically applied to the manufacture of a high-grade product made at low cost.

Consider that the maximum clearance between the barrel or bore of the injector and the plunger which moves within it must not exceed 50 millionths of an inch!

Consider further that at the tip end of the injector, the maximum clearance between the needle valve and the bore within which it seats must be less than one ten-thousandth of an inch.

One Ten-Thousandth of an Inch

What better impression can we give of the precision in this department than to say that the general run of the limits on all parts of the injector apart from those mentioned above, is of the order of one-ten-thousandth of an inch.

When such amazing figures are quoted publicly, it is only logical for people to question whether such limits of precision actually can be measured and proved. The answer is emphatically yes! Every one of these parts are measured by a remarkable instrument called the Electrolimit gauge which is accurate to the millionth part of an inch and gives an exact reading on a large calibrated scale. When you examine this scale you will find that the measurement of one-ten-thousandth of an inch—too small to comprehend—is shown on a scale some five inches in length, larger than the scale of one of the dash instruments on your automobile.

Up to the present time such precision has been unheard of in mass production. Nor was it a simple matter to introduce such processes since no one had made equipment of this character available commercially. The answer is found in the fact that this organization had to design much of its own production equipment and build it in accordance with the experience gained by many years of research and experimental production.

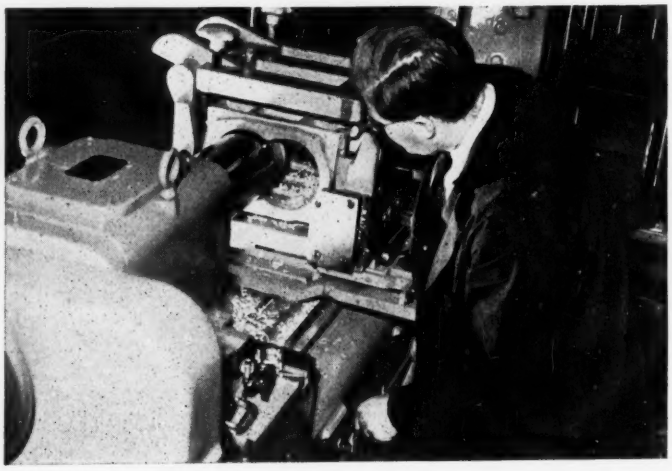
Another big problem was the matter of drilling the spray nozzle holes. They are tiny, as holes go, but in addition to accurate sizing the holes must be drilled at correct angles with precise spacing.

These holes are of various diameters depending upon the size of the engine. The general range lies between six-thousandths and fourteen-thousandths of an inch in diameter. Drilling is done by means of tiny drilling machines designed here, in which the drill is rotated at extremely high speeds by means of a tiny air-operated turbine—small in size but similar in principle to the huge turbines used for generating power. The tiny jeweler's drills are so sensitive to pressure that they cannot be fed into the work by mechanical means. So the drill spindle floats and is pressed into the work by the operator's finger as the drill rotates.

All of the internal parts and bushings are lapped to provide the desired finish and polish. While this is a hand operation, it is facilitated by the development of a battery of special lapping machines both for internal and external parts.

In another section of this department will be found the assembly line for the small engine injectors, as well as benches for assembly of large units. Before leaving this department, each injector is tested first on a machine which tests its seal under pressure of 5,000 pounds per square inch; then on another machine that "pops" the nozzle to assure clear passages.

The final step is the test department in which each injector is tested individually and calibrated according to specifications. Here will be found a testing machine with a universal fixture for handling all types of injectors; two other test machines for large injectors; and two multiple-head testing machines for small injectors. The latter test ten



Boring the aluminum blower housing of a General Motors Diesel engine. This hydraulically operated machine performs the exacting task in a matter of six minutes. The blower acts as a scavenger, forcing burned cases out of the cylinders and making it possible to employ the more efficient 2-cycle principle instead of the usual 4-cycle.

injectors in each machine. The entire battery is served by a central unit which circulates filtered oil and lubricant to all machines.

It is interesting to note that the calibration of injectors involves precise laboratory measurement. In the first place, each machine has an accurate device for counting the number of strokes of the injector plunger. When the injector is tested, it is run for a certain length of time, and during that interval the fuel oil that it ejects is collected in a laboratory graduate glass. When the test run is stopped, a reading is taken of the number of plunger strokes, and this number is divided into the amount of oil collected in the graduate. The quotient represents the number of cubic millimeters of fuel per stroke—which must be right "on the nose" with the specification or the injector is rejected. And that seldom happens in a day's work.

It is well worth noting that all precision grinding operations on injector elements are performed in a centralized grinding department located in the precision machining department but completely isolated from it. This is done for two reasons. First, it keeps the precision grinding department clean and free of any dust or dirt; second, it protects the precise drilling and lapping operations in the other departments from the fine dust and grit that may originate from the grinding wheels.

Study Plumbing Cross-Connections To Prevent Back-Flow in Water Pipes

An investigation started in 1936 to determine what minimum requirements are necessary to prevent back-flow or back-siphonage through cross connections from plumbing fixtures into water-supply pipes is reported in the April issue of the *Journal of Research.*[1] The report analyzes conditions in plumbing systems in regard to their maximum or limiting effects in producing back-flow, suggests minimum requirements for the prevention of back-flow, and includes a summary and discussion of the conclusions to be drawn from the results of the investigation. The conclusions relate only to the technical aspects of the subject, and do not suggest health or plumbing regulations.

The investigation was commenced in February, 1936, by Roy B. Hunter, C. E. Golden, and H. N. Eaton of the National Bureau of Standards' hydraulic laboratory. It included a review of the literature on the subject; a study of the influence of structural and service conditions on back-flow, and the limits necessary to consider in preventing back-flow; experimental research on the production of vacua in water-supply systems; and on means of preventing back-flow under minimum or limiting conditions.

The report will be considered by a subcommittee of the ASA Sectional Committee on Minimum Requirements for Standardization of Plumbing Equipment (A40). This subcommittee is now studying the possibility of revising the *Recommended Minimum Requirements for Plumbing*, a report issued in 1929 by the Subcommittee on Plumbing of the former U.S. Department of Commerce Building Code Committee.

The report published in the April issue of the *Journal of Research* will be helpful to the subcommittee in any recommendations it may make on cross connections in plumbing systems.

[1]Available from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 25 cents.

All Great Work Needs Standards

"So far is it from being true that there are no standards for great living that one might almost say the chief business of great living in every realm is the development of standards. Go into a scientific laboratory and tell them there are no standards in their work, and they will throw you out. That is their central business—standards of induction, of verification, of technique, and behind these, profound standards of veracity and of disinterested devotion to the truth.

"Wherever we find great work being done, in music, art, or science, amid the infinite variety of expressions, we find at the core and center of it all standards concerning which men are certain that nowhere can their disregard be right and their observance wrong."—*Harry Emerson Fosdick.*

British Issue New Mechanical Standards

The British Standards Institution recently appoved a number of standards in the mechanical field, as briefly described below.

Direction of Rotation of Machine-Tool Handwheels and Levers Relative to Movement Produced (No. 754 - 1937). This standard, meant to bring about uniformity in the direction of rotation of operating cranks, handwheels, levers, etc., will contribute considerably to the acquisition of automaticity by machine tool operators. In addition to general rules concerning the way in which the direction of rotation of the cranks, handwheels, levers, etc., shall be judged, the standard gives recommendations applying to center lathes, capstan lathes, drilling machines, planing machines; milling machines (vertical, hand, and plain); slotting machines; shaping machines; grinding machines; tool room grinders; surface grinders; and centerless grinders.

Internal - Combustion Engines, Carburettor-Type, Excluding Aero-Engines (No. 765 - 1938). This standard applies to engines for stationary and industrial purposes, engines for traction purposes (road and rail), and marine engines for main and auxiliary purposes on shipboard. It gives recommendations regarding rated output, speed, margin of capacity, governing (where a governor is fitted), fuel consumption, tests, standard equipment and auxiliary equipment. It also makes recommendations for the selection of engines for use with electrical generator and in two appendices lists particulars to be supplied by the engine maker, and "Information with Inquiry for Engine" (to be supplied to engine maker by the prospective customer).

Grub Screws (No. 768 - 1938). These screws are called "set screws" in this country. The British standard gives dimensional specifications for slotted head and socket head set screws (hexagon recess), and for the wrenches to be used with the latter.

Steel Flanged Joints for Hydraulic Pipe Lines for Pressures up to 4500 lb per Sq Inch (No. 778 - 1938). The specifications in this standard are divided into those for dimensions for oval steel flanges for steel pipes for hydraulic working pressures from 750 to 1,500 lb per sq in., and for steel flanges for pressures from 1,500 to 4,500 lb per sq in.

Copies of these British standards may be ordered or borrowed through the American Standards Association.

Warwick Named to Represent A.S.T.M. on International Testing Association

C. L. Warwick, Secretary-Treasurer, American Society for Testing Materials, has been named by the A.S.T.M. as its representative on the Permanent Committee of the International Association for Testing Materials.

The International Association recently reorganized to eliminate all personal and company members and replace them with national associations for testing materials, such as the American Society for Testing Materials.

W. L. Cooper, Director of Foreign Operations of the Robert W. Hunt Company, who is in Europe several months each year, has accepted appointment as Mr. Warwick's alternate to attend the meetings usually held in Europe.

The International Association has accepted an invitation from Professor Dr. Ing. P. Goerens (vice-president, Germany) on behalf of the Deutscher Verband fuer die Materialpruefungen der Technik for the next Congress of national societies to be held in Germany, probably in 1940.

Dr. M. Moser, Berlin, has been selected as secretary of the International Association for Testing Materials.

Domestic, Industrial Fuel Oils Covered by British Standard

Two fuel oils for domestic purposes, two for marine purposes, and four for industrial purposes are included in the British Standard Specifications for Fuel Oils for Burners. Tables showing the requirements for oils for these various uses and methods of test for the determination of viscosity, water content, sediment, Conradson carbon, pour point, and gross calorific value are included.

Copies of the standard, B.S.S. 742-1937, may be ordered or borrowed through the American Standards Association.

Building Code Committee Re-Elects Miller; Hears Committees Report Progress on Work

RUDOLPH P. MILLER, Consulting Engineer, was re-elected chairman of the Building Code Correlating Committee, and G. N. Thompson, National Bureau of Standards, was re-elected vice-chairman at the meeting of the BCCC at Washington, D. C., March 25. This meeting was held in conjunction with the sessions of the Building Officials Conference of America.

Members of the Executive Committee, also re-elected, are:

J. Andre Fouilhoux, American Institute of Architects
A. H. Hall, American Municipal Association
W. E. Mallalieu, National Board of Fire Underwriters
E. W. Roemer, Building Officials Conference of America
D. T. Webster, Associated General Contractors of America

New work for the development of building code requirements for re-enforced gypsum concrete, minimum design loads in buildings, and signs and billboards, was proposed at the meeting. The Building Code Correlating Committee is getting in touch with organizations which it is recommending to take the administrative responsibility for the proposed projects before it requests the American Standards Association to authorize the work.

Committees working on building code requirements under the supervision of the Building Code Correlating Committee reported that their work is making progress.

A report issued in 1925 by the former Department of Commerce Building Code Committee, and a supplement issued in 1931, have been circulated to the Sectional Committee on Building Code Requirements and Good Practice Recommendations for Masonry. Comments and criticisms received will be used as the basis for new recommendations.

Drafts Near Completion

Drafts of recommendations for building code requirements are being completed by the committees on Building Code Requirements for Light and Ventilation, and Administrative Requirements for Building Codes.

Work on draft proposals is also going forward in the committees on Building Code Requirements for Fire Protection and Fire Resistance, and for Chimneys and Heating Appliances.

The National Fire Protection Association suggested that existing standards be used as the basis for Building Code Requirements for Fire Extinguishing Equipment.

The sectional committee on Building Code Requirements for Iron and Steel is expecting to complete its study as to whether the American Institute of Steel Construction specifications on structural steel are suitable for inclusion in building codes within the next two or three months. This committee is also starting work on provisions for welding, and light-weight sections.

Basic Stress

The Advisory Committee on Working Stresses has decided that its work for the present centers on the recommendation of a basic stress level for particular materials and not in the development of detailed stress tabulations. The sectional committees, it believes, should deal with the detailed stresses. Much of the committee's work is concerned with two kinds of materials—those in which the strength as determined by test agrees fairly closely with service behavior; and those in which strength has only a remote relation to the expected service of the material. The two problems are distinctly different. Thus far the committee has dealt with only two materials. Test information on brick masonry has been compiled and distributed to the committee; and a compilation of data on structural steel has also been completed and distributed to the committee. As soon as work on these two materials is completed, the committee will take up a study of wood, concrete, and gypsum. A great amount of work is involved in these studies, in collecting and analyzing the test data, and circularizing engineers, architects, and building officials as to their experience with the service performance of materials.

Germany Adopts Square Meter To Measure Dressed Leather

The square meter has been set up by the German Government as the basis of measurement for all dressed leather bought or sold in Germany. A square meter is equivalent to 10.764 square feet.

S.A.E. Changes Viscosity Classification To Meet New Gear Designs, Higher Speeds

AN entirely new viscosity classification of transmission oils for automobiles, made necessary because of changes in the design of automobile gearing and increase in transmission speeds, was approved by the Standards Committee of the Society of Automotive Engineers in January.

The object of the SAE lubricant classification is to make it as easy as possible to select the most suitable viscosity for the conditions of use.

Before the adoption of the new classification there were five viscosity classes for transmission lubricants. The Lubricants Division of the S.A.E. made a careful study of actual practice and soon found that this was an unnecessarily large number. Furthermore, the old viscosity classification was based entirely upon 100 deg F, whereas the basis upon which the use of different grades was recommended was principally a matter of selecting a grade considered to be best for the average temperature to use. In other words, the heavier grades were recommended for summer use, and lighter grades for winter use. This suggested to the committee that a better classification could be based upon different temperatures. S.A.E. 80 corresponds more or less, in the transmission and rear axle classification, to the lightest grade of engine oil in engine oil classifications. It exists because a transmission lubricant really fluid at quite low temperatures is necessary. Therefore, the committee believed that the logical thing was to pick a temperature at zero for classifying S.A.E. 80.

S.A.E. 250 Unchanged

The winter grade most widely used is S.A.E. 90. After consideration of several lower temperatures the committee concluded that every purpose would be served by classifying S.A.E. 90 at 100 deg. In the new classification, therefore, S.A.E. 90 remains the same as it always has been. S.A.E. 80 is classified by a maximum viscosity at zero.

The three types—110, 160 and 250—were previously heavier than S.A.E. 90. These were all intended for normal summer operation. Because transmission and rear axle temperatures, today, are not a very great deal less than those prevailing in the engine, a classification at 210 is closer to service temperature. This was chosen, therefore, for the new classification of summer lubricants.

The committee's study also showed that there was no necessity for the 110 and 160 classifications. These have been replaced, therefore, by a new number, S.A.E. 140. This number represents the more desirable lubricants of both the old classifications, in that the viscosity gradings are taken at temperatures more nearly corresponding to the temperature ranges for which they are recommended. This new grade will, therefore, simplify the recommendations of car manufacturers and will reduce the number of grades which have to be carried at filling stations.

S.A.E. 90 at 100 deg

S.A.E. 250 is used to some extent in truck, bus, and industrial service but it is rarely used for passenger cars. It is probably most frequently employed where provisions against leakage are not too good, and where economy can, therefore, be obtained by using something heavier than the normal summer oil. Except for the fact that its minimum viscosity is now classified at 210 deg instead of 100 deg, S.A.E. 250 remains essentially unchanged.

When S.A.E. classifications are changed, the old classification remains in force simultaneously with the new one for a period of 18 months. Therefore, the old schedule, including S.A.E. 110 and S.A.E. 160, retains its official status until July, 1939. It is expected by the Society of Automotive Engineers that refiners will immediately adopt the new classification and that during the next 18 months practically all stocks of the old branding will have been consumed. Because S.A.E. 140 replaces two old grades, in a majority of cases this will not mean any actual change in lubricants now in existence. Most of the S.A.E. 160 oils now on the market are within the viscosity range of the new S.A.E. 140, so, in most instances, the only actual change will be in the brand number, the S.A.E. explains.

The old requirement concerning channeling remains in the classification. There is no standard test for this characteristic. It means that lubricants must not channel in actual service at the specified temperatures.

The actual classification as it will appear in the 1938 *S.A.E. Handbook* reads as follows:

"The S.A.E. viscosity numbers for transmission and rear axle lubricants constitute a classification in terms of viscosity and of consistency at low temperatures only. Other factors of quality or character are not considered.

"The viscosity range and consistency at low temperatures for the several classes of transmission and rear axle lubricants are defined in the following table:

S.A.E. Viscosity Number	*Viscosity Range Saybolt Universal*	*Consistency—Must not channel in service at °F.*
S.A.E. 80	100,000 seconds at 0°F Max.	—20
S.A.E. 90	800 to 1500 seconds at 100°F.	0
S.A.E. 140	120 to 200 seconds at 210°F.	+35
S.A.E. 250	200 seconds at 210°F Min.	—

"In the case of S.A.E. 80, the minimum viscosity limit is not specified since this grade is specially for use at very low temperatures at which S.A.E. 90 would be too heavy. The oil company furnishing the lubricant shall be responsible for maintaining a sufficiently high minimum viscosity to provide satisfactory lubrication. In a similar manner the maximum viscosity limit for S.A.E. 250 is not specified since this grade is a special one for temperatures at which S.A.E. 140 is too light. The oil company furnishing this lubricant shall be responsible for maintaining a sufficiently low maximum viscosity to provide satisfactory shifting of gears without channeling at the lowest temperature for which the lubricant is recommended.

"In the case of fluid greases made by adding soap or other thickening ingredients to oil, the viscosity number by which the lubricants are classified shall be determined by the viscosity of the oil before the addition of the soap or other thickening ingredients."

Australian Turpentine Revision Refers to American Standard

Separate percentages for the two types of turpentine recognized are included in the new proposed Australian Standard for turpentine now being circulated for criticism. The two types are those turpentines distilled from pine-oleo resins and those distilled from resinous woods.

With the draft standard on turpentine, a draft covering what is known in Australia as "mineral turpentine" is also being circulated. This type of turpentine is known in other countries as "white spirit." In Australia, however, "white spirit" has come to mean a solvent of the Stoddard type, used in the United States mainly as a dry-cleaning agent. In the new draft standard, two types of mineral turpentine, with high and low aromatic content respectively, are included, and the aniline cloud point has been used as the means of differentiation.

Saving Replacement Time

One of the advantages of standardization that pays real dividends is in using gears, bushings and other parts that can be readily replaced. It took a long time and several heart-breaking failures before standard drill bushings became a regular article of commerce. Making standard gears dates back many years, but there are still machine designers who do not fully appreciate their value.

One candy manufacturer is reported to have had so many delays from the replacement of special gears that he took a very drastic step. He had all his machinery redesigned so that standard gears could be used. Every gear was taken from the catalog of a well known gear maker. Now replacements can be made with a minimum of delay.—*American Machinist, April 6.*

The standard provides alternative use of a British Standard or A.S.T.M. distillation apparatus. This is provided by reference to British Standard Specification 658-1936 and American Society for Testing Materials' standard D 86-1935 (American Standard Z11.10-1935). The A.S.T.M. apparatus is widely used in Australia, according to the foreword to the standard.

All comments on the draft, which is a proposed revision of Technical Standards K7 and K8-1930, should be in the hands of the Standards Association of Australia by August 15, 1938. Copies of the draft may be borrowed from the American Standards Association.

Advisory Committee to Use College Study on Standard

A study of requirements included in the Commercial Standard on Mohair Pile Fabrics is being made at Pennsylvania State College, the results of which will be used by the Advisory Committee on Ultimate Consumer Goods in considering recommendations to the American Standards Association on the standard.

Have You the Proper Light?

The new American Recommended Practice of School Lighting gives basic information on *how much light* and *what kind of light* is needed for our various daily tasks.

Recommends the proper light intensities for:

Classrooms
Offices
Sewing rooms, drafting rooms, art rooms, etc.
Auditoriums
Cafeterias

Discusses such important factors to eye comfort as:

Color quality of light
Light reflection from ceilings and walls
Diffusion, distribution, and direction of lighting

A representative committee including ophthalmologists, physicists, architects, public health officials, power company representatives, educators and labor officials has developed this standard.

American Recommended Practice of School Lighting A23-1938 . . . . . 25c

Prepared under joint sponsorship of the Illuminating Engineering Society and the American Institute of Architects

AMERICAN STANDARDS ASSOCIATION

29 West 39th Street **New York**